



Technical Data

Service	chilled, hot water, 60% glycol
Flow characteristic	modified equal percentage
Action	90° rotation
Sizes	2" to 12"
Type of end fitting	grooved ANSI/AWWA (C606)
Materials*	
Body	ductile iron ASTM A536, grade 65-45-12
Disc	electroless nickel coated ductile iron
Seat	EPDM
Shaft	416 stainless steel
Body pressure rating	300 psi at -30°F to 275°F
Media temperature range	-30°F to 250°F [-34°C to 120°C]
Operation ambient temperature range	-22°F to 122°F [-30°C to 50°C]
Maximum close-off pressure	200 psi
Maximum velocity	20 FPS

*VIC®300 Masterseal™ as manufactured by Victaulic Company

- 200 psi (2" to 12") bubble tight shut-off
- Long stem design allows for 2" insulation
- Completely assembled and tested, ready for installation

Application

These valves are designed to meet the needs of HVAC and commercial applications requiring bubble tight shut-off for liquids. Typical applications include chiller isolation, cooling tower isolation, change-over systems, large air handler coil control, bypass and process control applications. The large C_v values provide for an economical control valve solution for larger flow applications.

Jobsite Note

Valves should be stored in a weather protected area prior to construction.

		2-way			Suitable Actuators			
		Valve Nominal Size		Type	Spring Return	Non-Spring Return		
C _V 90°	C _V 60°	IN	DN [mm]	2-way	VIC	VIC	VIC	VIC
115	36	2"	50	F650VIC	AF Series	AM Series	GM Series	SY Series
260	80	2½"	65	F665VIC				
440	140	3"	80	F680VIC				
820	250	4"	100	F6100VIC				
1200	370	5"	125	F6125VIC	AF Series	AM Series	GM Series	
1800	560	6"	150	F6150VIC				
3400	1050	8"	200	F6200VIC				
5800	1800	10"	250	F6250VIC				
9000	2790	12"	300	F6300VIC	AF Series	AM Series	GM Series	

Valve	Size	C _v	30°	40°	50°	60°	70°	90°
F650VIC	2"	115	7	14	23	36	60	115
F665VIC	2-1/2"	260	16	30	50	80	140	260
F680VIC	3"	440	26	50	90	140	230	440
F6100VIC	4"	820	50	100	160	250	430	820
F6125VIC	5"	1200	70	140	240	370	620	1200
F6150VIC	6"	1800	110	220	360	560	940	1800
F6200VIC	8"	3400	200	410	670	1050	1770	3400
F6250VIC	10"	5800	350	700	1150	1800	3020	5800
F6300VIC	12"	9000	540	1080	1780	2790	4680	9000

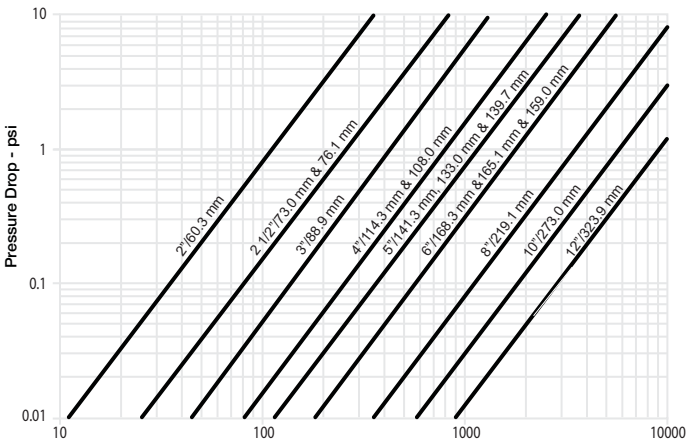
Maximum Dimensions (Inches)									
Valve	Size	Cv 90°	A(Max)	B (Max)	C (Max)	D(Max)	Actuator	Close-Off (PSI)	
F650VIC	2"	115	3.21 [81.5]	4.7 [120]	8.0 [204]	13.2 [334]	AM... GM... 2*GM	200	Non-Spring Return
F665VIC	2½"	260	3.77 [95.8]	4.7 [120]	8.0 [204]	13.6 [345]		50	
F665VIC	2½"	260	3.77 [95.8]	7.0 [178]	8.0 [204]	14.0 [358]		200	
F680VIC	3"	440	3.77 [95.8]	7.0 [178]	8.0 [204]	14.3 [364]		200	
F6100VIC	4"	820	4.63 [117.6]	8.6 [219]	8.0 [204]	19.6 [499]	AF... 2*AF... AF...	200	Spring Return
F650VIC	2"	115	3.21 [81.5]	2.0 [51]	8.6 [219]	14.0 [357]		200	
F665VIC	2½"	260	3.77 [95.8]	2.0 [51]	8.6 [219]	14.5 [368]		50	
F665VIC	2½"	260	3.77 [95.8]	8.6 [219]	8.6 [219]	18.7 [476]		200	
F680VIC	3"	440	3.77 [95.8]	2.0 [51]	8.6 [219]	14.7 [374]	SY1... SY2... SY2.../ SY3... SY2.../ SY3... SY4... SY4.../ SY5... SY6...	50	Non-Spring Return
F650VIC	2"	115	3.21 [82]	3.2 [82]	2.4 [61]	15.7 [398]		200	
F665VIC	2½"	260	3.77 [96]	3.2 [82]	2.4 [61]	16.2 [409]		200	
F680VIC	3"	440	3.77 [96]	3.2 [82]	2.4 [61]	16.4 [415]		200	
F680VIC	3"	440	3.77 [96]	4.6 [117]	9.2 [234]	26 [660]	SY2.../ SY3... SY2.../ SY3... SY4... SY4.../ SY5... SY6...	200	Non-Spring Return
F6100VIC	4"	820	4.63 [118]	4.6 [117]	9.2 [234]	26.7 [679]		200	
F6125VIC	5"	1200	5.88 [150]	4.6 [117]	9.2 [234]	27.7 [704]		50/200	
F6150VIC	6"	1800	5.88 [150]	4.6 [117]	9.2 [234]	28.2 [717]		50/200	
F6200VIC	8"	3400	5.33 [136]	7.3 [184]	10.9 [275]	33.3 [846]	SY4... SY4.../ SY5... SY6...	200	Non-Spring Return
F6250VIC	10"	5800	6.40 [163]	7.3 [184]	10.9 [275]	35 [890]		50/200	
F6300VIC	12"	9000	6.50 [165]	7.3 [184]	10.9 [275]	36 [916]		200	

†SY6 and larger available in 110/220 VAC versions only.
SY... maximum actuator ambient temperature is 150°F.

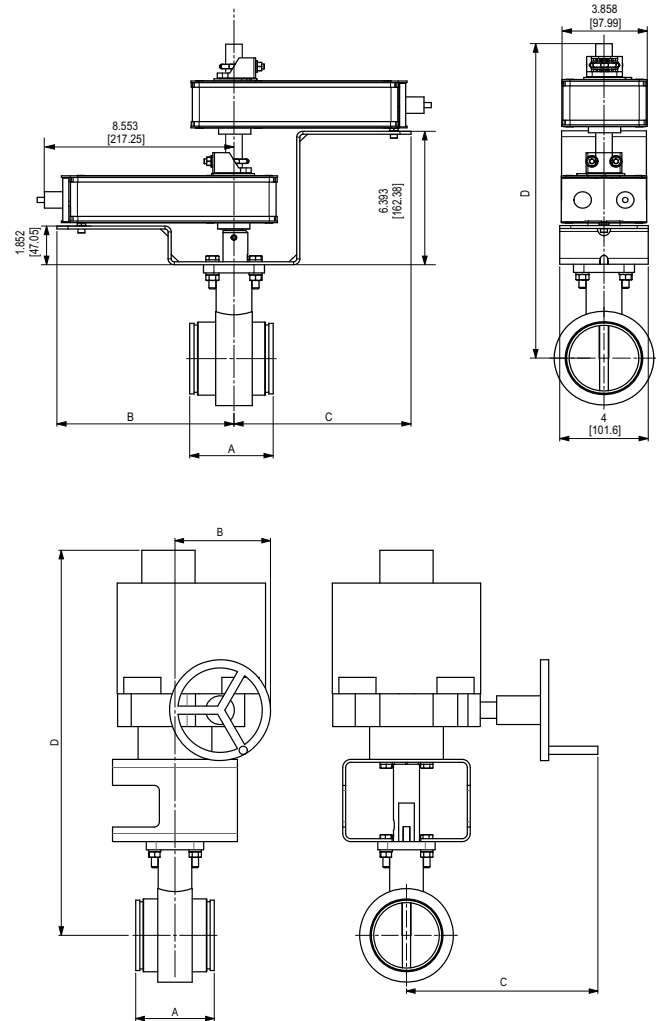
Application Notes

- 1. Valves are rated at 200 psi differential pressure in the closed position
- 2. 2-way assemblies are furnished assembled and tested, ready for installation.
- 3. Dimension "D" allows for actuator removal without the need to remove the valve from the pipe.
- 4. Belimo SY Series actuators are NEMA 4X rated.
- 5. Provide support for the actuator if it is mounted at any angle other than 90° vertical.
- 6. Installer is to use rigid type couplings for connecting the valve to the piping.

Flow Rate (GPM)



Dimensions



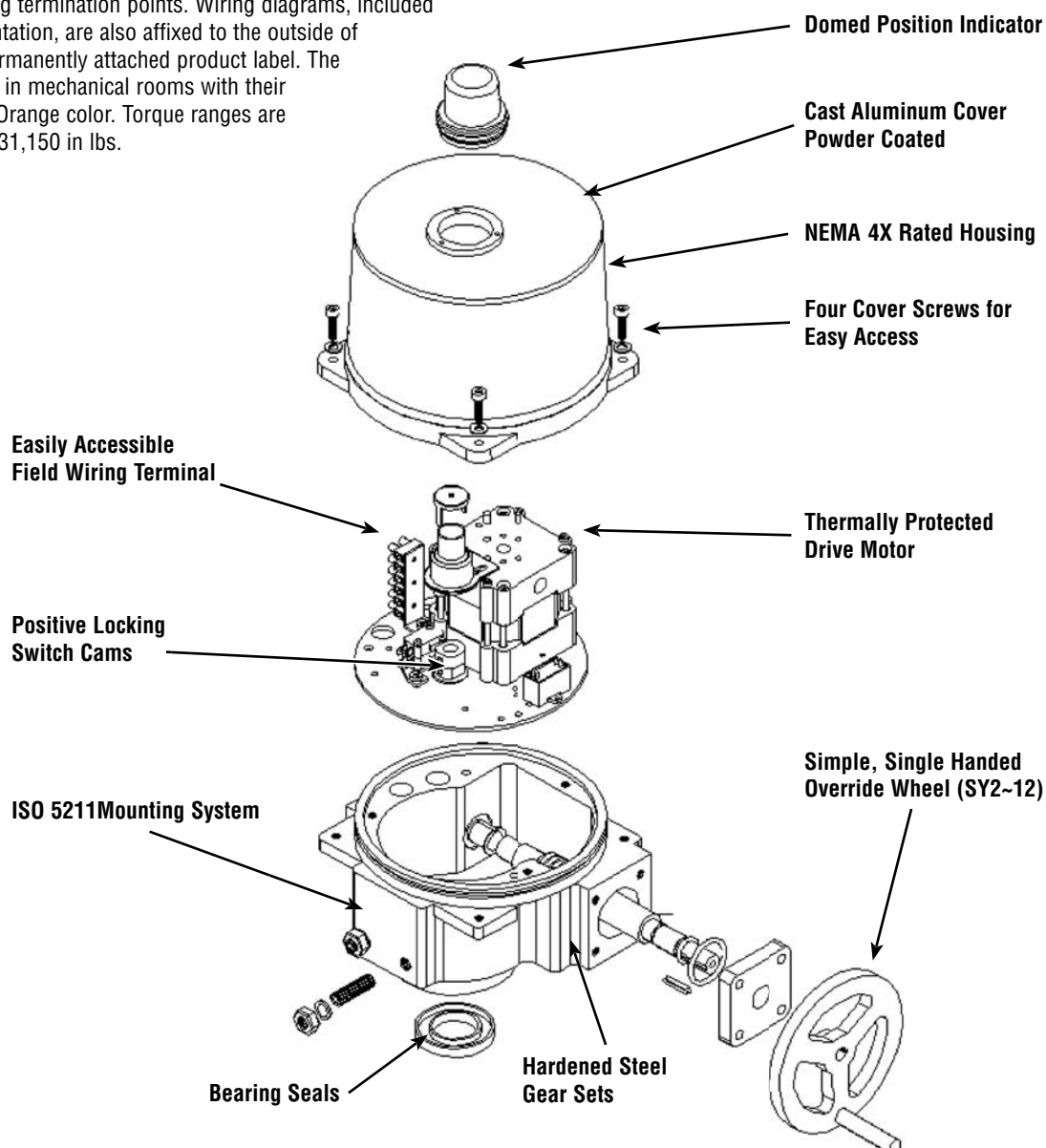
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SY Series Actuators

Belimo's SY series electric actuators have been designed to mate with our HD(U) and SHP... series butterfly valves and other quarter turn valve applications.

The patented gear drive mechanism provides for efficient, smooth operation while allowing easy manual override at any time. Drawing upon years of experience in the actuation industry, we have incorporated the most desirable features into the SY product range.

All units have NEMA 4X ratings, easily visible position indicators, international standard ISO5211 mounting systems, internal thermal motor overload protection, heater, dual auxiliary Form C switches, and easily accessible wiring termination points. Wiring diagrams, included in all printed documentation, are also affixed to the outside of the housing on the permanently attached product label. The units are easily visible in mechanical rooms with their characteristic Belimo Orange color. Torque ranges are available from 310 to 31,150 in lbs.





Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on Belimo standard and high performance valve series, these actuators are available for on/off and modulating applications. Depending on the application, they are available in 24 VAC/VDC, 120 VAC and 230 VAC.

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Motor protection	H Class insulation (SY-1), F Class (SY-2...5)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-24) on/off, floating point (SY...24MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...24MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...24MFT) 1.0 mA/500mV
Feedback	(SY...24MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY2-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

Power Supply

24 VAC/VDC 50/60Hz, single phase

Model	Torque	Speed	Power Consumption	Duty Cycle		Override	Weight
				On/Off	MFT		
SY1-24(P)	35Nm/310 in-lbs	15s	1.8A	30%	75%	8mm Wrench	2.0kg/4.9 lb.
SY2-24(MFT)	90Nm/801 in-lbs	15s	3.0A	30%	75%	Hand Wheel	11kg/24.5 lb.
SY3-24(MFT)	150Nm/1335 in-lbs	22s	3.0A	30%	75%	Hand Wheel	11kg/24.5 lb.
SY4-24(MFT)	400Nm/3560 in-lbs	16s	6.0A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-24(MFT)	500Nm/4450 in-lbs	22s	6.5A	30%	75%	Hand Wheel	22kg/48.5 lb.

SY...120V Series Non-Spring Return Actuator

Technical Data - 120 VAC



Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on Belimo standard and high performance valve series, these actuators are available for on/off and modulating applications. Depending on the application, they are available in 24 VAC/ VDC, 120 VAC and 230 VAC.

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Motor protection	H Class insulation (SY-1), F Class (SY-2...12)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-110) on/off, floating point (SY...120MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...120MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...120MFT) 1.0 mA/500mV
Feedback	(SY...120MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY2-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

Note: Leakage current is possible (<3.5 mA).
Connect ground before applying voltage.

Power Supply 120 VAC 50/60Hz, single phase

Model	Torque	Speed 60Hz	Speed 50Hz	Power Consumption	Duty Cycle		Override	Weight
					On/Off	Proportional		
SY1-110(P)	35Nm/310 in-lbs	12s	13s	0.5A	30%	75%	8mm Wrench	2.0kg/4.9 lb.
SY2-120(MFT)	90Nm/801 in-lbs	15s	17s	1.0A	30%	75%	Hand Wheel	11kg/24.5 lb.
SY3-120(MFT)	150Nm/1335 in-lbs	22s	26s	1.0A	30%	75%	Hand Wheel	11kg/24.5 lb.
SY4-120(MFT)	400Nm/3560 in-lbs	16s	18s	1.3A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-120(MFT)	500Nm/4450 in-lbs	22s	25s	1.5A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY6-120(MFT)	650Nm/5785 in-lbs	28s	31s	1.8A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY7-120(MFT)	1000Nm/8900 in-lbs	46s	55s	3.2A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY8-120(MFT)	1500Nm/13350 in-lbs	46s	55s	4.0A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY9-120(MFT)	2000Nm/17800 in-lbs	58s	70s	3.2A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY10-120(MFT)	2500Nm/22250 in-lbs	58s	70s	4.0A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY11-120(MFT)	3000Nm/26700 in-lbs	58s	70s	3.0A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY12-120(MFT)	3500Nm/31150 in-lbs	58s	70s	4.0A	30%	50%	Hand Wheel	56kg/123.5 lb.

800-543-9038 USA

866-805-7089 CANADA

203-791-8396 LATIN AMERICA / CARIBBEAN



Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on Belimo standard and high performance valve series, these actuators are available for on/off and modulating applications. Depending on the application, they are available in 24 VAC/ VDC, 120 VAC and 230 VAC.

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Overload protection	thermally protected 135°C cut-out
Motor protection	H Class insulation (SY-1), F Class (SY-2...12)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-220) on/off, floating point (SY...230MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...230MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...230MFT) 1.0 mA/500mV
Feedback	(SY...230MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY2-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

Power Supply

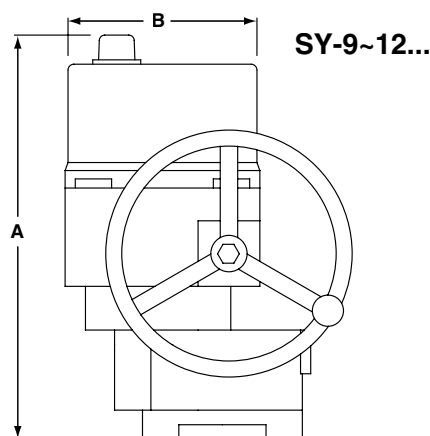
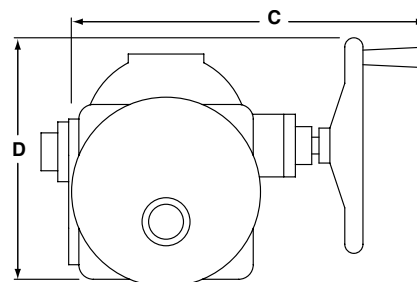
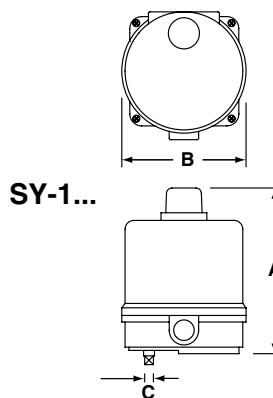
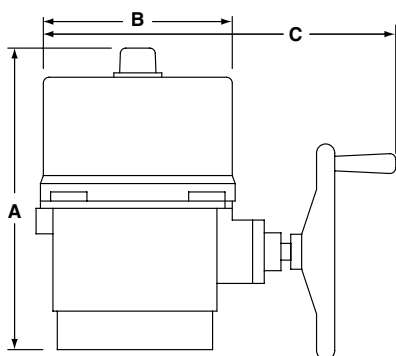
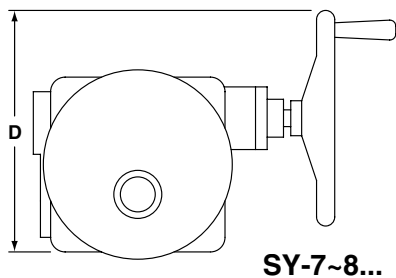
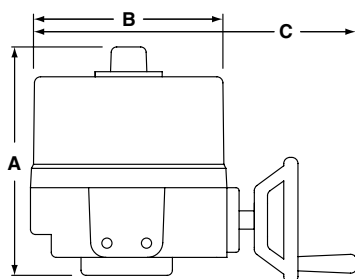
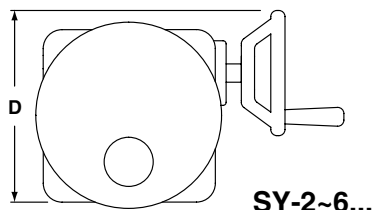
230 VAC 50/60Hz, single phase

Model	Torque	Speed 60Hz	Speed 50Hz	Power Consumption	Duty Cycle		Override	Weight
					On/Off	MFT		
SY1-220(P)	35Nm/310 in-lbs	12s	13s	0.3A	30%	75%	8mm Wrench	2.0kg/4.9 lb.
SY2-230(MFT)	90Nm/801 in-lbs	15s	17s	0.5A	30%	75%	Hand Wheel	11kg/24.5 lb.
SY3-230(MFT)	150Nm/1335 in-lbs	22s	26s	0.5A	30%	75%	Hand Wheel	11kg/24.5 lb.
SY4-230(MFT)	400Nm/3560 in-lbs	16s	18s	0.6A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-230(MFT)	500Nm/4450 in-lbs	22s	25s	0.7A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY6-230(MFT)	650Nm/5785 in-lbs	28s	31s	0.8A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY7-230(MFT)	1000Nm/8900 in-lbs	46s	55s	1.6A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY8-230(MFT)	1500Nm/13350 in-lbs	46s	55s	2.0A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY9-230(MFT)	2000Nm/17800 in-lbs	58s	70s	1.6A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY10-230(MFT)	2500Nm/22250 in-lbs	58s	70s	2.0A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY11-230(MFT)	3000Nm/26700 in-lbs	58s	70s	1.6A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY12-230(MFT)	3500Nm/31150 in-lbs	58s	70s	2.2A	30%	50%	Hand Wheel	56kg/123.5 lb.

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MODEL	DIM A (MAX)	Add to Dim A for cover removal	DIM B	DIM C (MAX)	DIM D
	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]
SY1	6.10 [155]	3.94 [100]	4.25 [108]	8mm	-
SY2~3	10.04 [255]	7.48 [190]	7.87 [200]	12.99 [330]	7.87 [200]
SY4~6	12.40 [315]	8.86 [225]	9.21 [234]	14.96 [380]	11.81 [300]
SY7~8	16.54 [420]	8.86 [225]	9.21 [234]	17.72 [450]	13.39 [340]
SY9~12	23.23 [590]	8.86 [225]	10.24 [260]	18.50 [470]	13.78 [350]

Note: ~ indicates range of actuator i.e., SY2~3 = SY-2 and SY-3

24 VAC					
	SY1	SY2	SY3	SY4	SY5
	Amps	Amps	Amps	Amps	Amps
wire gauge	1.8	3	3	6	6.5
MAX Distance between Actuator and Supply (feet)					
18	92	55	55		
16	144	87	87	43	40
14	233	140	140	70	65
12	357	214	214	107	99
10	606	364	364	182	168
8	905	543	543	271	250

110 VAC												
	SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
wire gauge	0.5	1	1	1.3	1.5	1.8	3.2	4	3.2	4	3	4
MAX Distance between Actuator and Supply (feet)												
18	1515	758	758	583	505	421	237	189	237	189	253	189
16	2381	1190	1190	916	794	661	372	298	372	298	397	298
14	3846	1923	1923	1479	1282	1068	601	481	601	481	641	481
12	5882	2941	2941	2262	1961	1634	919	735	919	735	980	735
10	10000	5000	5000	3846	3333	2778	1563	1250	1563	1250	1667	1250
8	14925	7463	7463	5741	4975	4146	2332	1866	2332	1866	2488	1866

220 VAC												
	SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
wire gauge	0.3	0.5	0.5	0.6	0.7	0.8	1.6	2	1.6	2	1.6	2.2
MAX Distance between Actuator and Supply (feet)												
18	5051	3030	3030	2525	2165	1894	947	758	947	758	947	689
16	7937	4762	4762	3968	3401	2976	1488	1190	1488	1190	1488	1082
14	12821	7692	7692	6410	5495	4808	2404	1923	2404	1923	2404	1748
12	19608	11765	11765	9804	8403	7353	3676	2941	3676	2941	3676	2674
10	33333	20000	20000	16667	14286	12500	6250	5000	6250	5000	6250	4545
8	49751	29851	29851	24876	21322	18657	9328	7463	9328	7463	9328	6784

The NEC mandates that 24 VAC over 100 VA power requires CLASS 1 wiring conduit. Local codes may vary. Do NOT mix CLASS 1 & CLASS 2 circuits in the same conduit. Generally, 24 VAC actuators over 100 VA should be changed to 120 VAC models.

Actuators: SYx-MFT



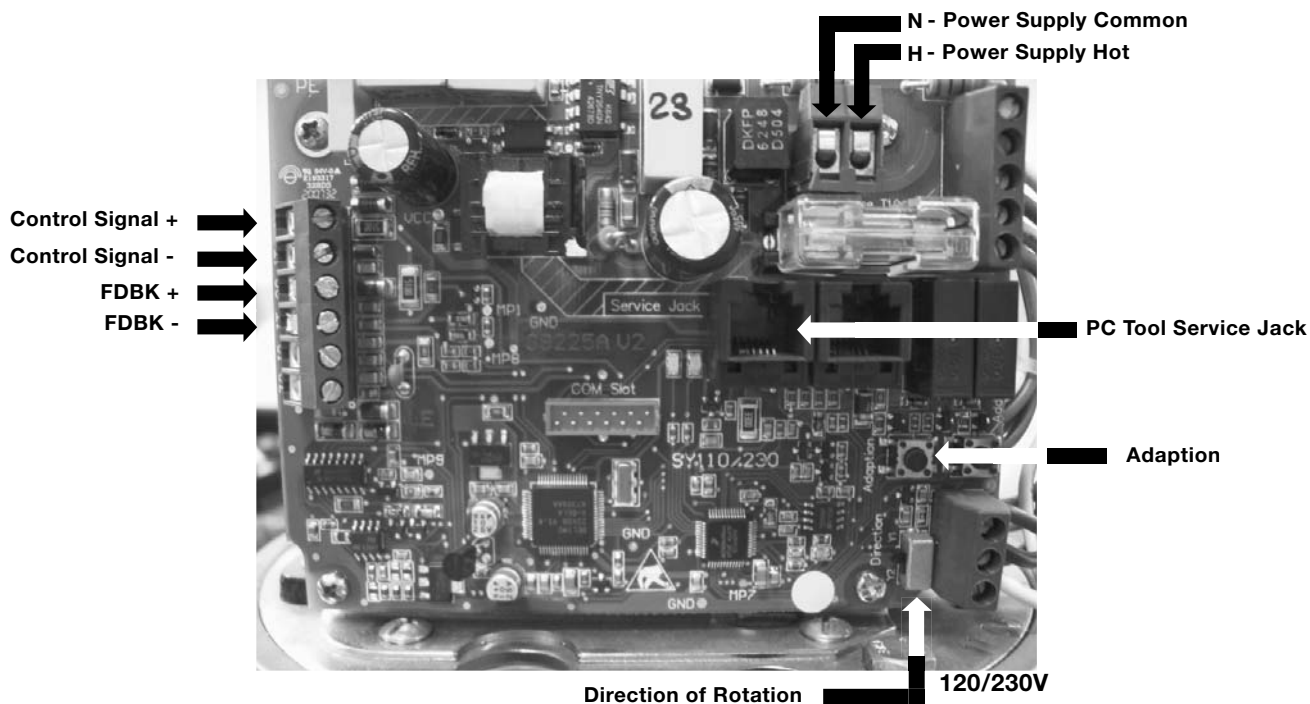
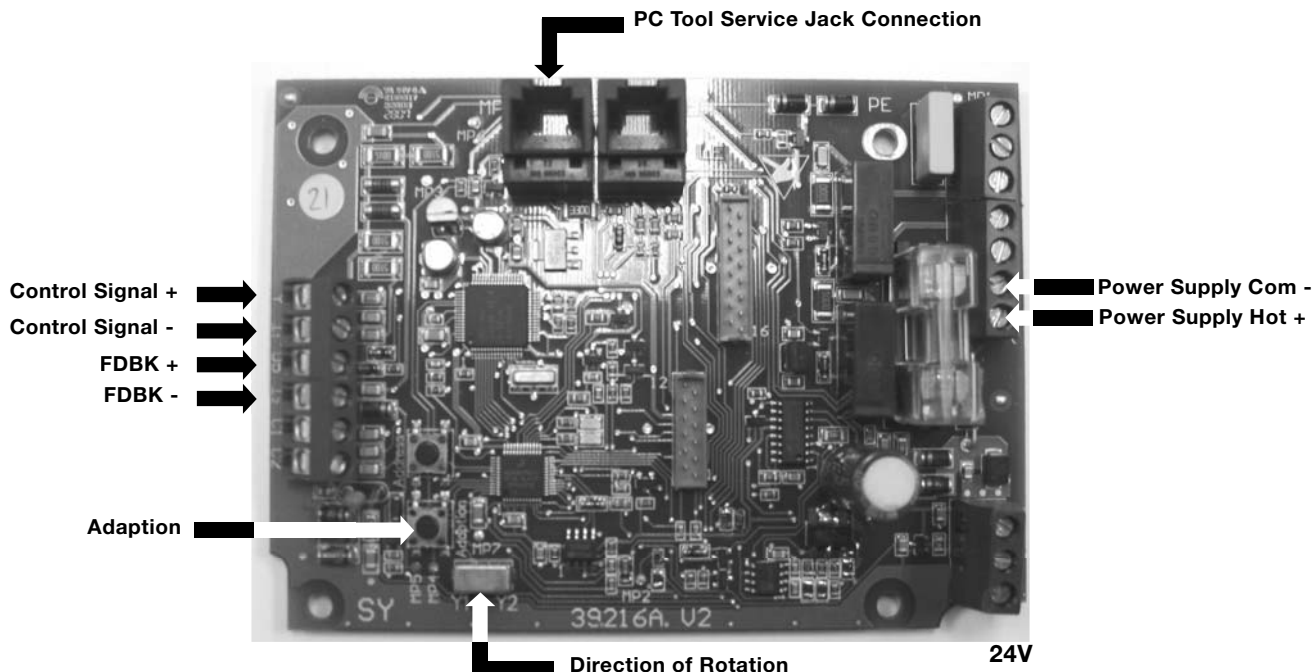
INSTALLATION NOTES

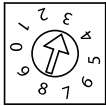
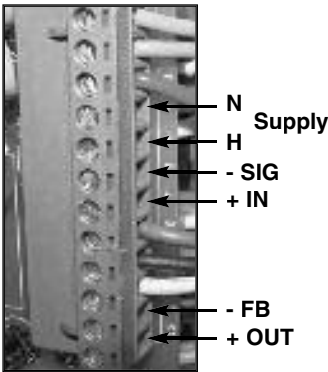
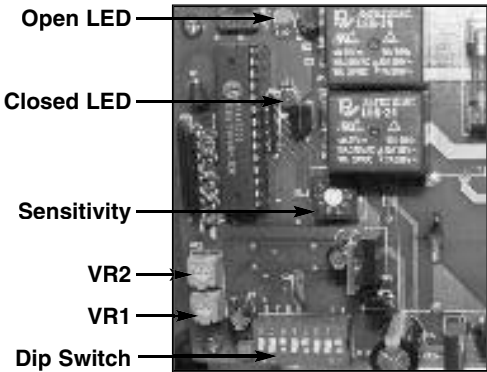


CAUTION

Notes:

1. Motor CAMS have been factory calibrated and should not be moved.
2. An adaption must be performed if any limit switch is adjusted. This will calibrate the beginning and end stopping points. Press the adaption button for 3 seconds and release.
3. New SY actuators must have an adaption performed before operation.





Sensitivity switch setting is position #3 for factory default. To widen dead-band, select a higher number (up to 9).



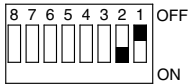
INSTALLATION NOTES

CAUTION

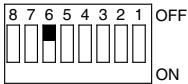
Notes:

- 1. Applicable to the SY1 and legacy SY2-12 actuators.
- 2. **Do not change sensitivity or dip switch settings with power applied!**
- 3. VR1 and VR2 are factory calibrated and should not be moved.
- 4. Motor CAMS have been factory calibrated and should not be moved.

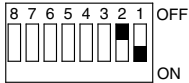
Dip Switch Settings



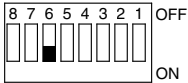
INPUT = 2-10 VDC



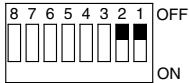
RESPONSE = DIRECT



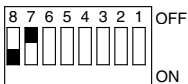
INPUT = 4-20mA



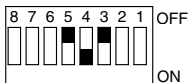
RESPONSE = REVERSE



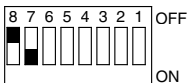
INPUT = 1-5 VDC



LOSS OF SIGNAL = CLOSED
(Direct Acting)



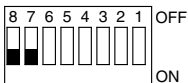
OUTPUT = 4-20mA



LOSS OF SIGNAL = OPEN
(Direct Acting)
LOSS OF SIGNAL = CLOSED
(Reverse Acting)



OUTPUT = 2-10 VDC



LOSS OF SIGNAL = STOP



WARNING

Potentiometer
(Factory Pre-set)

For 2-position actuators with 1k feedback option

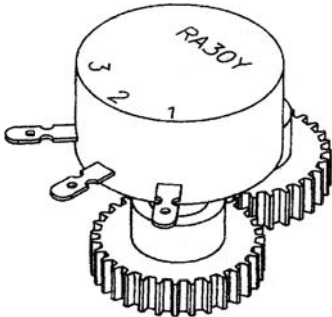
Potentiometer points 1, 2, 3 are wired to terminal blocks 8, 9, 10.

When a valve is closed: 8, 9 → 1k Ω
9, 10 → 0k Ω
When a valve is opened: 8, 9 → 0k Ω
9, 10 → 1k Ω

For modulating actuators with 1k feedback option*

Potentiometer points 1, 2, 3 are wired to terminal blocks 8, 9, 10.

When a valve is closed: 8, 9 → 1k Ω
9, 10 → 0k Ω
When a valve is opened: 8, 9 → 0k Ω
9, 10 → 1k Ω

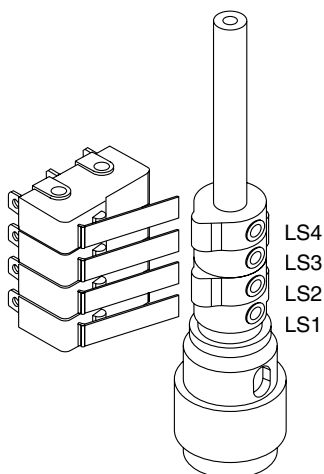


*On modulating actuators **DO NOT** master/slave using optional potentiometer.



Electrical Travel Adjustment (Factory Pre-set)

SY-1



Factory pre-set see chart below. Field adjustable if required



LS4
Auxiliary Switch for Closed Indication



LS3
Auxiliary Switch for Opened Indication

Factory pre-set and calibrated. Do not adjust - warranty voided



LS2
"CLOSE"
Clockwise Decrease Closed Angle
Counter-clockwise Increase Closed Angle

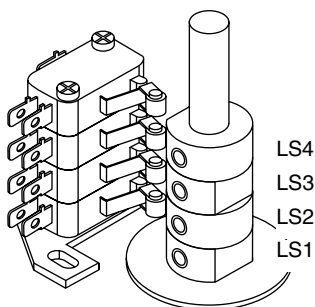


LS1
"OPEN"
Clockwise Increase Opening Angle
Counter-clockwise Decrease Opening Angle



Electrical Travel Adjustment

SY-2-12



Factory pre-set see chart below. Field adjustable if required



LS4
Auxiliary Switch for Closed Indication



LS3
Auxiliary Switch for Opened Indication

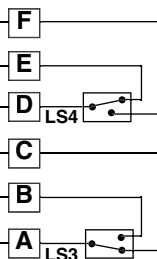
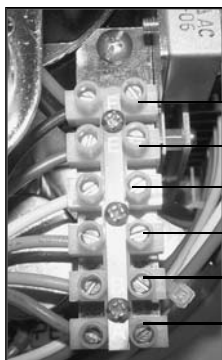
Factory pre-set and calibrated. Do not adjust - warranty voided



LS2
"CLOSE"
Clockwise Decrease Closed Angle
Counter-clockwise Increase Closed Angle



LS1
"OPEN"
Clockwise Increase Opening Angle
Counter-clockwise Decrease Opening Angle



Switches at left are shown with actuator fully open.

	0°	5°	85°	90°
LS3	A - B		A - C	
	0°	5°	85°	90°
LS4	D - F	D - E		



INSTALLATION NOTES



CAUTION

Notes:

1. An adaption must be performed when the limit switches are adjusted. For the SYx-MFT actuators. This will calibrate the beginning and end stopping points. Press the adaption button for 3 seconds and release.

Wiring for Damper Actuators and Control Valves

On/Off, 24V, 120/230V



Actuators: SY1-24 SY1-110 SY2...12-110 SY2...12-220

W546

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).



NOTES SY1...12-110 (220)

- **Caution:** Power Supply Voltage
- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input.
- "H" (L2) cannot be connected to terminal #3 and #4 simultaneously.
- **Required:** Terminal #7 needs to be field wired to enable heater circuit.

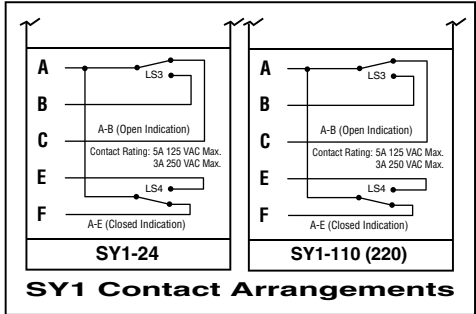
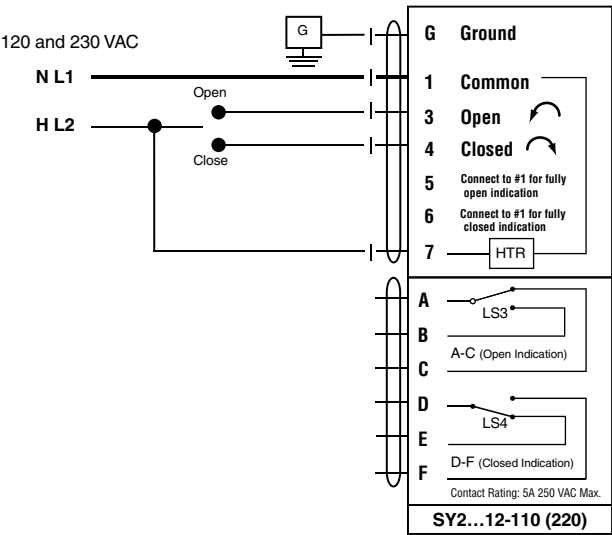
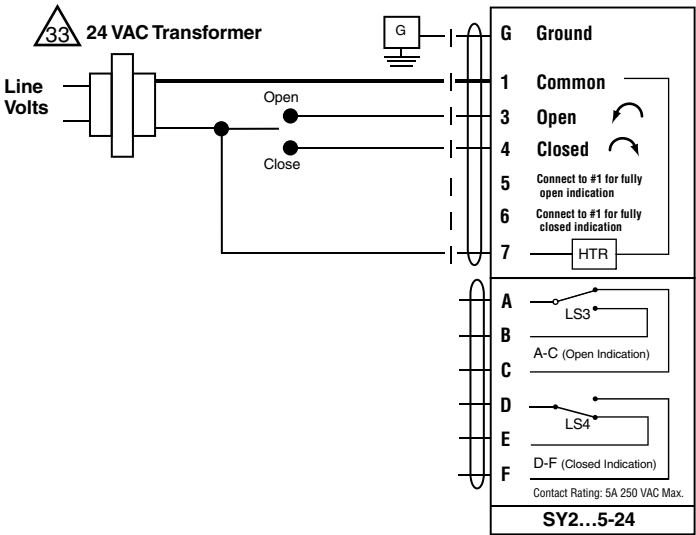


NOTES SY1...5-24



Each actuator should be powered by a single, isolated control transformer.

- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input.
- "H" cannot be connected to terminal #3 and #4 simultaneously.
- **Required:** Terminal #7 needs to be field wired to enable heater circuit.



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Actuators: SY1-24P SY1-110P SY1-220P

W547

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

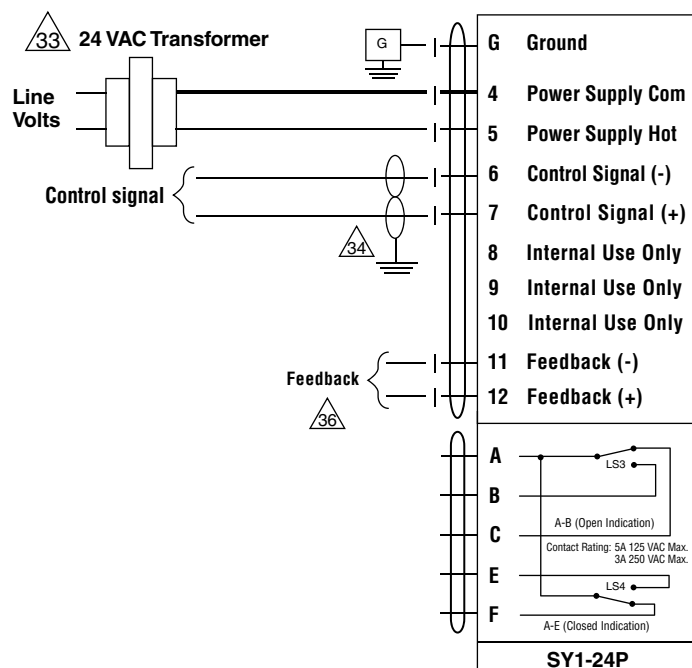
Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

NOTES SY1...24P

- Each actuator should be powered by a single, isolated control transformer.
- Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited. Terminals 4 and 6 need to be wired separately.
- Do not change sensitivity or dip switch settings with power applied.



INSTALLATION NOTES

Observe Class 1 and Class 2 wiring restrictions.

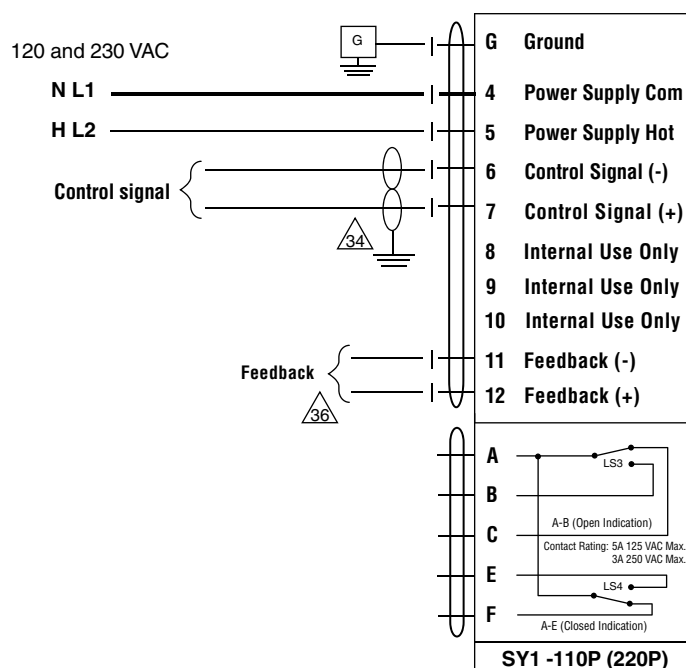
Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A, 3.75A X 24 VAC = 90VA Transformer)

APPLICATION NOTES

- Ground shielded wire at control panel chassis. Tape back ground at actuator.
- Use of feedback is optional.

NOTES SY1...110P (220P)

- Caution:** Power supply voltage.
- Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited. Terminals 4 and 6 need to be wired separately.
- Do not change sensitivity or dip switch settings with power applied.



Wiring for Damper Actuators and Control Valves

Proportional, 24V, 120/230V



Actuators: SY2...5-24MFT SY2...12-120MFT SY2...12-230MFT

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

NOTES SY2...5-24MFT

- Each actuator should be powered by a single, isolated control transformer.
- Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited.

INSTALLATION NOTES

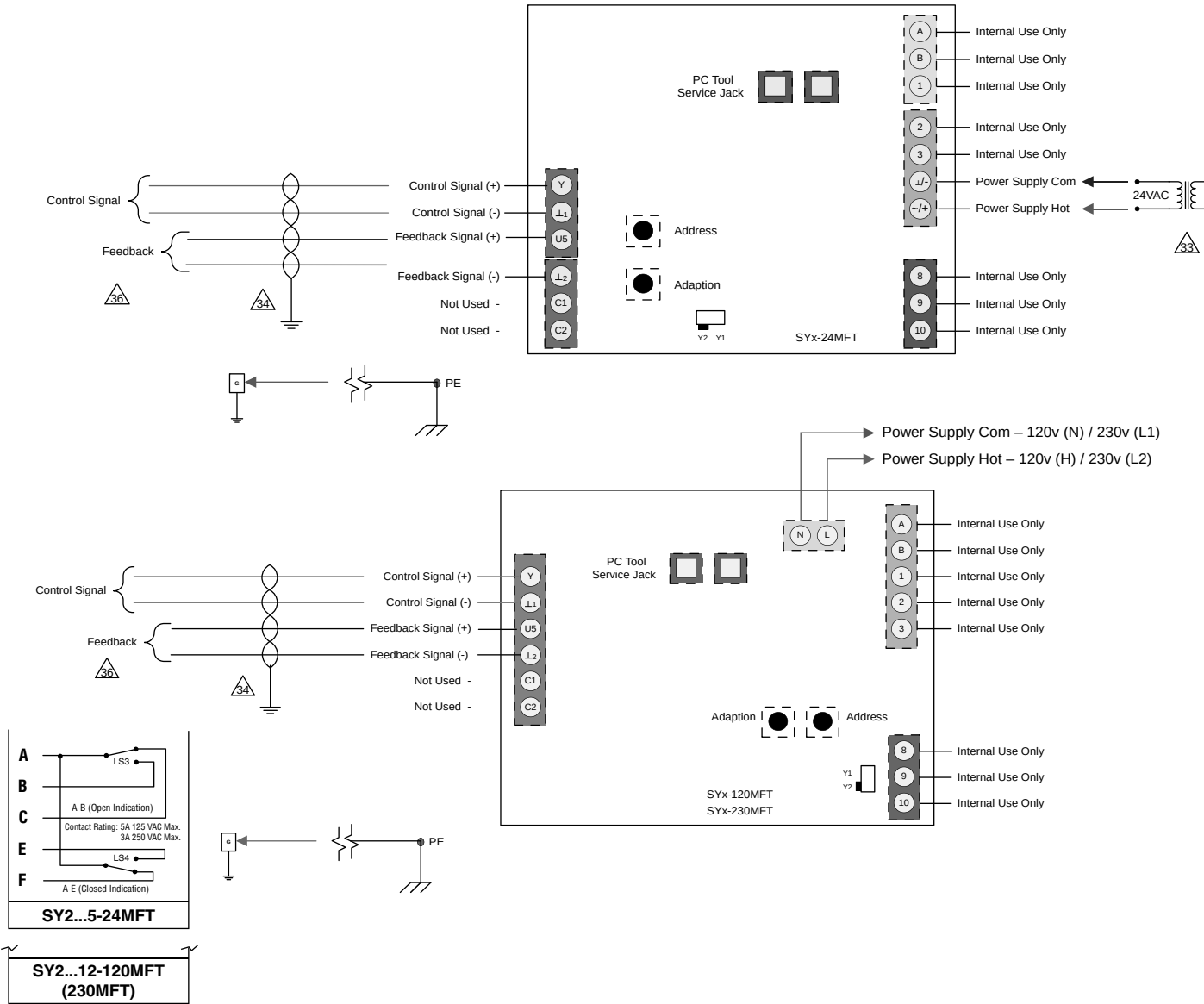
Observe Class 1 and Class 2 wiring restrictions.
Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A, 3.75A X 24 VAC = 90VA Transformer)

APPLICATION NOTES

- Ground shielded wire at control panel chassis. Tape back ground at actuator.
- Use of feedback is optional.

NOTES SY2...12-120MFT (230MFT)

- Caution: Power supply voltage.



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SY Actuator Wiring Diagram, SY1...5-24 – Multiple Wiring
SY1...12-110 (220) – Multiple Wiring

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

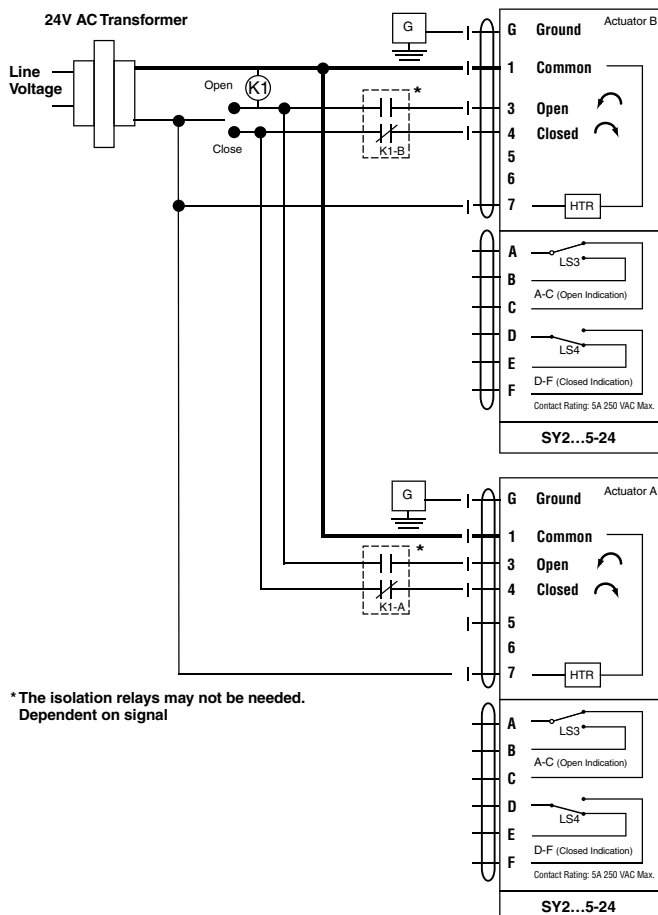
Equipment damage!
Power consumption and input impedance must be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF.

This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor.

On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, typically 40-60 volts, so while the actuator still turns in the commanded direction (the 120V winding), the drag from the other reduces the torque output and causes overheating.



* The isolation relays may not be needed.
Dependent on signal

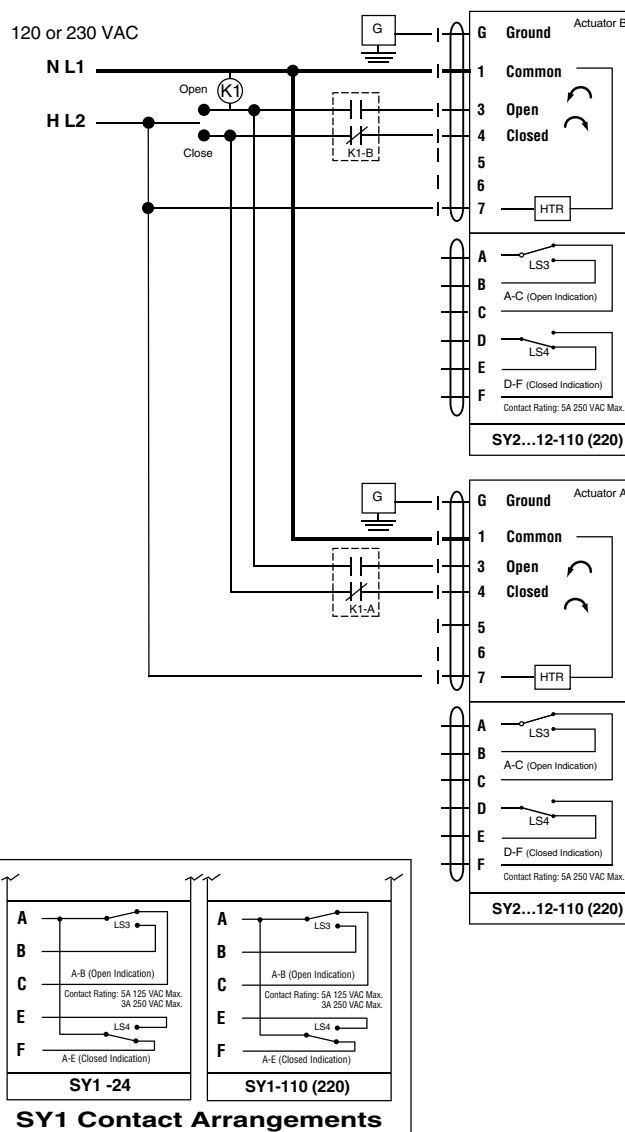
INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).

NOTES

- **Caution:** Power Supply Voltage.
- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input. Should be DPDT.
- "H" (L2) cannot be connected to terminal #3 and #4 simultaneously.
- **Required:** Terminal #7 needs to be field wired to enable heater circuit.



SY Actuator Wiring Diagram, SY1-24P – Multiple Wiring

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF.

This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor.
On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, typically 40-60 volts, so while the actuator still turns in the commanded direction (the 120v winding), the drag from the other reduces the torque output and causes overheating.

INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).

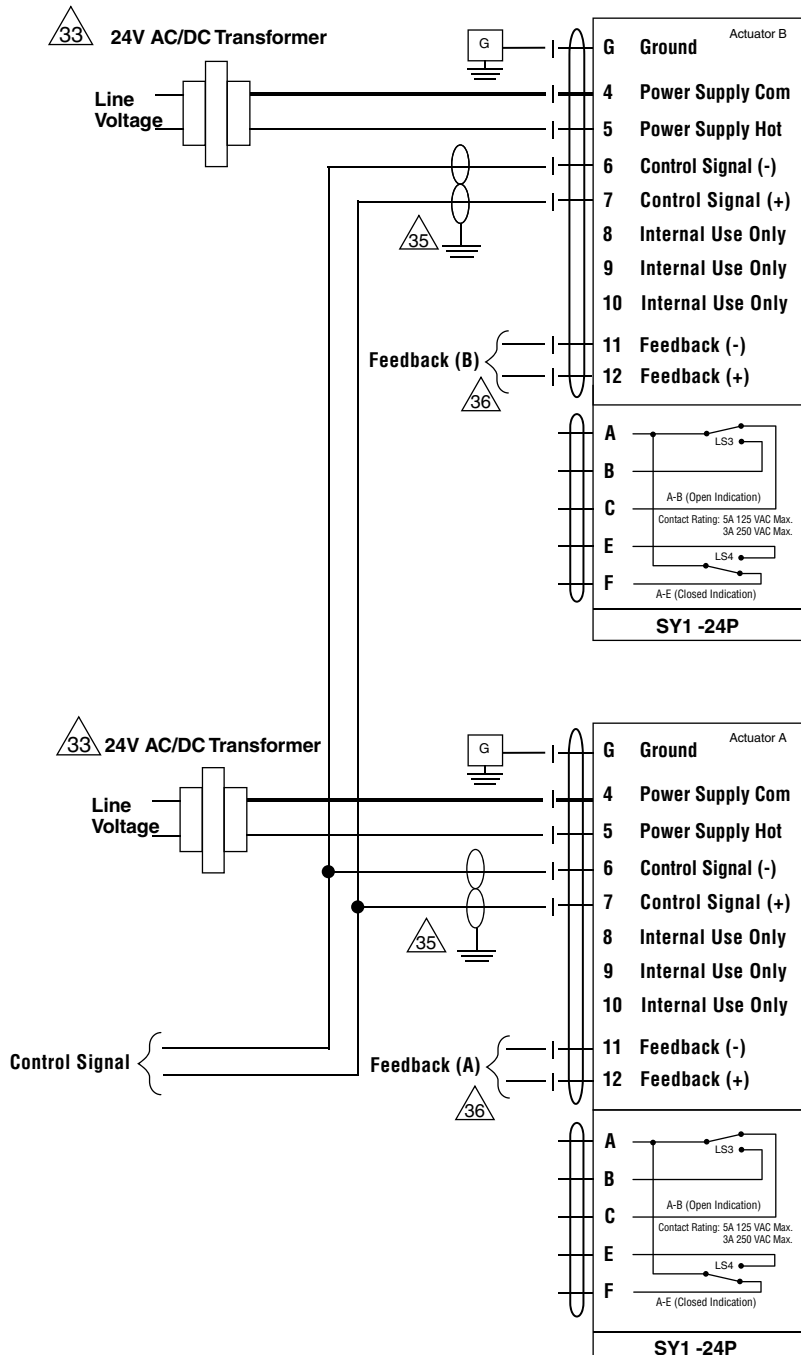
NOTES SY1-24P

Each actuator should be powered by a single, isolated control transformer.

- **SY1-24P notes:** Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited. Terminals 4 and 6 need to be wired separately otherwise irreversible damage will occur.
- Do not change sensitivity or dip switch settings with power applied.

APPLICATION NOTES

- 35 Recommended twisted shielded pair for control wiring. Ground shielded wire at control panel chassis. Tape back ground at actuator.
- 36 Use of feedback is optional.



W550_2_11

Actuators: SY2...5-24MFT

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF.

This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor.

On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, typically 40-60 volts, so while the actuator still turns in the commanded direction (the 120v winding), the drag from the other reduces the torque output and causes overheating.

INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).

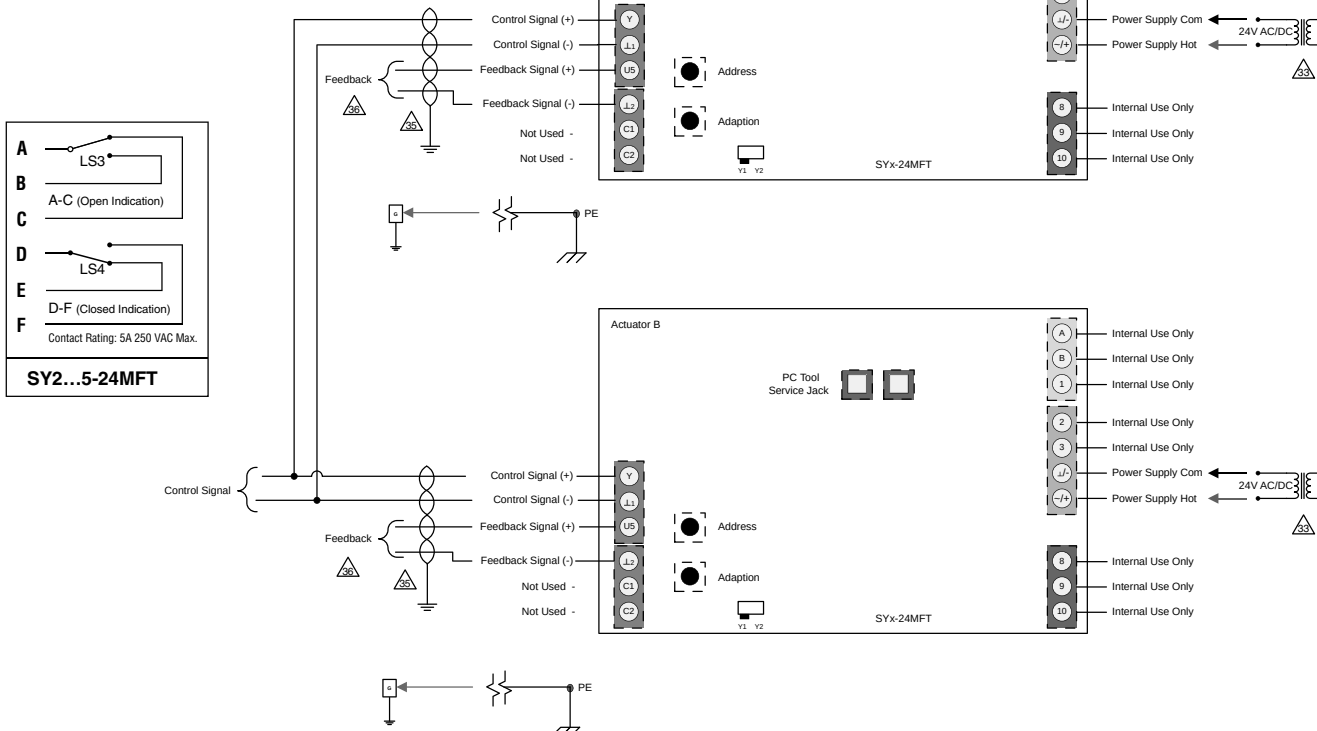
NOTES SY2...5-24MFT

Each actuator should be powered by a single, isolated control transformer.

APPLICATION NOTES

Recommended twisted shielded pair for control wiring.
Ground shielded wire at control panel chassis.
Tape back ground at actuator.

Use of feedback is optional.



Wiring for Control Valves
Proportional, 110/220V, 120/230V



W552_1_11

Actuators: SY1-110P SY1-220P

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



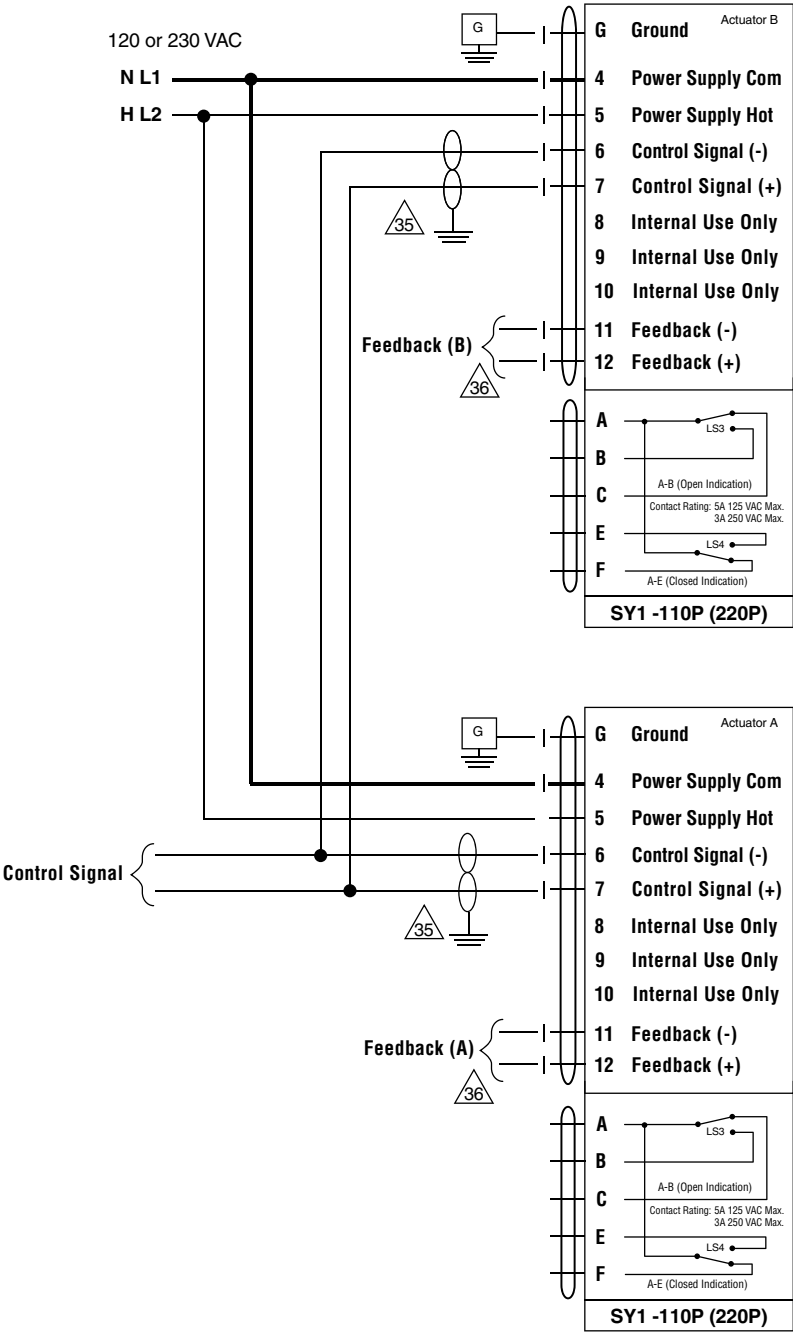
APPLICATION NOTES

- 35 Recommended twisted shielded pair for control wiring. Ground shielded wire at control panel chassis. Tape back ground at actuator.
- 36 Use of feedback is optional.



NOTES SY1-110P (220P)

- Caution: Power supply voltage.
- Do not change sensitivity or dip switch settings with power applied.



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W552_2

Actuators: SY2...12-120MFT SY2...12-230MFT

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF.

This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor.

On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, typically 40-60 volts, so while the actuator still turns in the commanded direction (the 120V winding), the drag from the other reduces the torque output and causes overheating.



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



APPLICATION NOTES



Recommended twisted shielded pair for control wiring.
Ground shielded wire at control panel chassis.
Tape back ground at actuator.



Use of feedback is optional.



NOTES SY2...12-120MFT (230MFT)

- **Caution:** Power supply voltage.

